

CLAIMS

What is claimed is:

1. A system comprising:

5

a host/data controller; and

a memory system comprising a plurality of memory cartridges operably coupled to the
host/data controller, each memory cartridge comprising an operation indicator
10 configured to indicate the operational status of the corresponding memory cartridge.

10
11
12
13
14
15
16
17
18
19
20

2. The system, as set forth in claim 1, wherein the memory system comprises a redundant
memory system.

15

3. The system, as set forth in claim 2, wherein the memory system comprises five memory
cartridges.

20

4. The system, as set forth in claim 3, wherein the operation indicator comprises a bit having a
first state and a second state, the first state indicating that the memory cartridge is operational and
the second state indicating that the memory cartridge is not operational.

5. The system, as set forth in claim 4, wherein the memory system is configured to operate in a redundant mode when each of the bits is in the first state.

5 6. The system, as set forth in claim 5, wherein at least one of the host/data controller and the plurality of memory cartridges comprise error detection components.

10 7. The system, as set forth in claim 6, wherein the host/data controller is configured to generate a low priority interrupt signal in response to error detection by the error detection components if each of the operation bits is in the first state.

15 8. The system, as set forth in claim 6, wherein the host/data controller is configured to generate a low priority interrupt signal in response to multi-bit error detection by the error detection components if each of the operation bits is in the first state.

9. The system, as set forth in claim 6, wherein the host/data controller is configured to 20 generate a high priority interrupt signal in response to multi-bit error detection if at least one of the operation bits is in the second state.

10. The system, as set forth in claim 1, wherein each of the plurality of memory cartridges comprises a plurality of memory devices.

5 11. A method of generating interrupts in a redundant memory, comprising the acts of:

detecting an error in a memory system;

10 determining the operational status of the memory system; and

15 initiating a system interrupt signal, the type of system interrupt signal being dependent on the operational status of the memory system.

15. The method, as set forth in claim 11, wherein the act of detecting an error comprises the act of detecting a multi-bit error.

20 13. The method, as set forth in claim 11, wherein the act of determining the operational status comprises the act of determining whether the system is operating in one of a redundant mode and a non-redundant mode.

14. The method, as set forth in claim 13, wherein the act of determining the operational status comprises reading a plurality of operation bits, each of the operation bits indicating the operational status of a corresponding segment of the memory, the operational status comprising one of an operational state and a non-operational state.

5

15. The method, as set forth in claim 14, wherein the act of determining the operational status comprises reading five operation bits.

10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
4410
4411
4412
4413
4414
4415
4416
4417
4418
4419
4420
4421
4422
4423
4424
4425
4426
4427
4428
4429
4430
4431
4432
4433
4434
4435
4436
4437
4438
4439
4440
4441
4442
4443
4444
4445
4446
4447
4448
4449
44410
44411
44412
44413
44414
44415
44416
44417
44418
44419
44420
44421
44422
44423
44424
44425
44426
44427
44428
44429
44430
44431
44432
44433
44434
44435
44436
44437
44438
44439
44440
44441
44442
44443
44444
44445
44446
44447
44448
44449
444410
444411
444412
444413
444414
444415
444416
444417
444418
444419
444420
444421
444422
444423
444424
444425
444426
444427
444428
444429
444430
444431
444432
444433
444434
444435
444436
444437
444438
444439
444440
444441
444442
444443
444444
444445
444446
444447
444448
444449
4444410
4444411
4444412
4444413
4444414
4444415
4444416
4444417
4444418
4444419
4444420
4444421
4444422
4444423
4444424
4444425
4444426
4444427
4444428
4444429
4444430
4444431
4444432
4444433
4444434
4444435
4444436
4444437
4444438
4444439
4444440
4444441
4444442
4444443
4444444
4444445
4444446
4444447
4444448
4444449
44444410
44444411
44444412
44444413
44444414
44444415
44444416
44444417
44444418
44444419
44444420
44444421
44444422
44444423
44444424
44444425
44444426
44444427
44444428
44444429
44444430
44444431
44444432
44444433
44444434
44444435
44444436
44444437
44444438
44444439
44444440
44444441
44444442
44444443
44444444
44444445
44444446
44444447
44444448
44444449
444444410
444444411
444444412
444444413
444444414
444444415
444444416
444444417
444444418
444444419
444444420
444444421
444444422
444444423
444444424
444444425
444444426
444444427
444444428
444444429
444444430
444444431
444444432
444444433
444444434
444444435
444444436
444444437
444444438
444444439
444444440
444444441
444444442
444444443
444444444
444444445
444444446
444444447
444444448
444444449
4444444410
4444444411
4444444412
4444444413
4444444414
4444444415
4444444416
4444444417
4444444418
4444444419
4444444420
4444444421
4444444422
4444444423
4444444424
4444444425
4444444426
4444444427
4444444428
4444444429
4444444430
4444444431
4444444432
4444444433
4444444434
4444444435
4444444436
4444444437
4444444438
4444444439
4444444440
4444444441
4444444442
4444444443
4444444444
4444444445
4444444446
4444444447
4444444448
4444444449
44444444410
44444444411
44444444412
44444444413
44444444414
44444444415
44444444416
44444444417
44444444418
44444444419
44444444420
44444444421
44444444422
44444444423
44444444424
44444444425
44444444426
44444444427
44444444428
44444444429
44444444430
44444444431
44444444432
44444444433
44444444434
44444444435
44444444436
44444444437
44444444438
44444444439
44444444440
44444444441
44444444442
44444444443
44444444444
44444444445
44444444446
44444444447
44444444448
44444444449
444444444410
444444444411
444444444412
444444444413
444444444414
444444444415
444444444416
444444444417
444444444418
444444444419
444444444420
444444444421
444444444422
444444444423
444444444424
444444444425
444444444426
444444444427
444444444428
444444444429
444444444430
444444444431
444444444432
444444444433
444444444434
444444444435
444444444436
444444444437
444444444438
444444444439
444444444440
444444444441
444444444442
444444444443
444444444444
444444444445
444444444446
444444444447
444444444448
444444444449
4444444444410
4444444444411
4444444444412
4444444444413
4444444444414
4444444444415
4444444444416
4444444444417
4444444444418
4444444444419
4444444444420
4444444444421
4444444444422
4444444444423
4444444444424
4444444444425
4444444444426
4444444444427
4444444444428
4444444444429
4444444444430
4444444444431
4444444444432
4444444444433
4444444444434
4444444444435
4444444444436
4444444444437
4444444444438
4444444444439
4444444444440
4444444444441
4444444444442
4444444444443
4444444444444
4444444444445
4444444444446
4444444444447
4444444444448
4444444444449
44444444444410
44444444444411
44444444444412
44444444444413
44444444444414
44444444444415
44444444444416
44444444444417
44444444444418
44444444444419
44444444444420
44444444444421
44444444444422
44444444444423
44444444444424
44444444444425
44444444444426
44444444444427
44444444444428
44444444444429
44444444444430
44444444444431
44444444444432
44444444444433
44444444444434
44444444444435
44444444444436
44444444444437
44444444444438
44444444444439
44444444444440
44444444444441
44444444444442
44444444444443
44444444444444
44444444444445
44444444444446
44444444444447
44444444444448
44444444444449
444444444444410
444444444444411
444444444444412
444444444444413
444444444444414
444444444444415
444444444444416
444444444444417
444444444444418
444444444444419
444444444444420
444444444444421
444444444444422
444444444444423
444444444444424
444444444444425
444444444444426
444444444444427
444444444444428
444444444444429
444444444444430
444444444444431
444444444444432
444444444444433
444444444444434
444444444444435
444444444444436
444444444444437
444444444444438
444444444444439
444444444444440
444444444444441
444444444444442
444444444444443
444444444444444
444444444444445
444444444444446
444444444444447
444444444444448
444444444444449
4444444444444410
4444444444444411
4444444444444412
4444444444444413
4444444444444414
4444444444444415
4444444444444416
4444444444444417
4444444444444418
4444444444444419
4444444444444420
4444444444444421
4444444444444422
4444444444444423
4444444444444424
4444444444444425
4444444444444426
4444444444444427
4444444444444428
4444444444444429
4444444444444430
4444444444444431
4444444444444432
4444444444444433
4444444444444434
4444444444444435
4444444444444436
4444444444444437
4444444444444438
4444444444444439
4444444444444440
4444444444444441
4444444444444442
4444444444444443
4444444444444444
4444444444444445
4444444444444446
4444444444444447
4444444444444448
4444444444444449
44444444444444410
44444444444444411
44444444444444412
44444444444444413
44444444444444414
44444444444444415
44444444444444416
44444444444444417
44444444444444418
44444444444444419
44444444444444420
44444444444444421
44444444444444422
44444444444444423
44444444444444424
44444444444444425
44444444444444426
44444444444444427
44444444444444428
44444444444444429
44444444444444430
44444444444444431
44444444444444432
44444444444444433
44444444444444434
44444444444444435
44444444444444436
44444444444444437
44444444444444438
44444444444444439
44444444444444440
44444444444444441
44444444444444442
44444444444444443
44444444444444444
44444444444444445
44444444444444446
44444444444444447
44444444444444448
44444444444444449
444444444444444410
444444444444444411
444444444444444412
444444444444444413
444444444444444414
444444444444444415
444444444444444416
444444444444444417
444444444444444418
444444444444444419
444444444444444420
444444444444444421
444444444444444422
444444444444444423
444444444444444424
444444444444444425
444444444444444426
444444444444444427
444444444444444428
444444444444444429
444444444444444430
444444444444444431
444444444444444432
444444444444444433
444444444444444434
444444444444444435
444444444444444436
444444444444444437
444444444444444438
444444444444444439
444444444444444440
444444444444444441
444444444444444442
444444444444444443
444444444444444444
444444444444444445
444444444444444446
444444444444444447
444444444444444448
444444444444444449
4444444444444444410
4444444444444444411
4444444444444444412
4444444444444444413
4444444444444444414
4444444444444444415
4444444444444444416
4444444444444444417
4444444444444444418
4444444444444444419
4444444444444444420
4444444444444444421
4444444444444444422
4444444444444444423
4444444444444444424
4444444444444444425
4444444444444444426
4444444444444444427
4444444444444444428
4444444444444444429
4444444444444444430
4444444444444444431
4444444444444444432
4444444444444444433
4444444444444444434
4444444444444444435
4444444444444444436
4444444444444444437
4444444444444444438
4444444444444444439
4444444444444444440
4444444444444444441
4444444444444444442
4444444444444444443
4444444444444444444
4444444444444444445
4444444444444444446
4444444444444444447
4444444444444444448
4444444444444444449
44444444444444444410
44444444444444444411
44444444444444444412
44444444444444444413
44444444444444444414
44444444444444444415
44444444444444444416
44444444444444444417
44444444444444444418
44444444444444444419
44444444444444444420
44444444444444444421
44444444444444444422
44444444444444444423
44444444444444444424
44444444444444444425
44444444444444444426
44444444444444444427
44444444444444444428
44444444444444444429
44444444444444444430
44444444444444444431
44444444444444444432
44444444444444444433
44444444444444444434
44444444444444444435
44444444444444444436
44444444444444444437
44444444444444444438
44444444444444444439
44444444444444444440
44444444444444444441
44444444444444444442
44444444444444444443
44444444444444444444
44444444444444444445
44444444444444444446
44444444444444444447
44444444444444444448
44444444444444444449
444444444444444444410
444444444444444444411
444444444444444444412
444444444444444444413
444444444444444444414
444444444444444444415
444444444444444444416
444444444444444444417
444444444444444444418
444444444444444444419
444444444444444444420
444444444444444444421
444444444444444444422
444444444444444444423
444444444444444444424
444444444444444444425
444444444444444444426
444444444444444444427
444444444444444444428
444444444444444444429
444444444444444444430
4444444

18. A memory cartridge comprising:

a plurality of memory modules; and

5 a memory controller operably coupled to each of the plurality of memory modules and comprising a programmable masking register configured to store an error identification corresponding to one of the plurality of memory modules in which an error has been detected.

10

19. The memory cartridge, as set forth in claim 18, wherein each of the plurality of memory modules comprises a dual inline memory module (DIMM).

15

20. The memory cartridge, as set forth in claim 19, wherein each of the dual inline memory modules comprises a plurality of synchronous dynamic random access memory (SDRAM) devices.

20

21. The memory cartridge, as set forth in claim 18, wherein the programmable masking register is configured to store a chip select corresponding to one of the plurality of memory modules in which an error has been detected.

22. The memory cartridge, as set forth in claim 18, comprising compare logic configured to compare the error identification stored in the programmable masking register to any error identification corresponding to any subsequent errors detected in one of the plurality of memory modules.

5

23. The memory cartridge, as set forth in claim 22, comprising configuration logic configured to block the generation of an interrupt signal from the memory controller if the error identification stored in the programmable masking register matches the error identification corresponding to any subsequent errors.

10
11
12
13
14
15
16
17
18
19
20

24. A method of masking the error generation in a memory module comprising the acts of:

detecting a faulty memory module;

storing a unique memory module identification corresponding to the faulty memory module in a masking register;

20 detecting errors in a plurality of memory modules each memory module comprising a corresponding unique memory module identification;

comparing each of the memory module identifications in which an error is detected with the memory module identification corresponding to the faulty memory module; and

5 blocking the generation of errors to a host/data controller if the memory module
identification corresponding to the memory module in which an error is detected
is the same as the memory module identification corresponding to the faulty
memory module.

25. The method of masking the error generation in a memory module, as set forth in claim 24, wherein the act of detecting a faulty memory module comprises the act of detecting the faulty memory module in a memory cartridge.

15¹⁵ 26. The method of masking the error generation in a memory module, as set forth in claim 25, wherein the act of detecting errors in a plurality of memory modules comprises the act of detecting errors in a plurality of memory modules in the memory cartridge.

27. The method of masking the error generation in a memory module, as set forth in claim
24, wherein the act of detecting a faulty memory module comprises the act of detecting the faulty
dual inline memory module (DIMM).

28. The method of masking the error generation in a memory module, as set forth in claim
24, wherein the act of storing a unique memory module identification comprises the act of
storing a chip select corresponding to the faulty memory module.

5

29. The method of masking the error generation in a memory module, as set forth in claim
26, wherein the act of storing comprises storing a unique memory module identification
corresponding to the faulty memory module in a masking register, wherein the masking register
is on the memory cartridge.

10

30. A computer system comprising:

11

a host/data controller;

15

a plurality of memory cartridges operably coupled to the host/data controller, each of the
plurality of memory cartridges comprising a memory controller;

20

a command bus operably coupled between the host/data controller and the plurality of
memory controllers and configured to transmit commands from the host/data
controller to the plurality of memory controllers; and

error detection logic located on the command bus and configured to detect errors on the command bus.

5 31. The computer system, as set forth in claim 30, wherein the plurality of memory cartridges form a redundant memory array.

10 32. The computer system, as set forth in claim 30, wherein each of the plurality of memory cartridges comprises a plurality of memory modules, each of the plurality of memory modules comprising a plurality of memory devices.

15 33. The computer system, as set forth in claim 32, wherein each of the plurality of memory cartridges comprises a plurality of dual inline memory modules (DIMM), each of the plurality of memory modules comprising a plurality of synchronous dynamic random access memory (SDRAM) devices.

20 34. The computer system, as set forth in claim 30, comprising a command bus interface coupled between the plurality of memory cartridges and the error detection logic, the command bus interface configured to facilitate the exchange of data and commands between the host/data controller and the plurality of memory cartridges.

35. The computer system, as set forth in claim 34, comprising decode logic coupled between the command bus interface and the plurality of memory cartridges and configured to translate a system address into a memory address and a memory address into a system address for associated read and write commands between the host/data controller and the plurality of memory controllers.

5

36. The computer system, as set forth in claim 30, wherein the error detection logic comprises an ECC algorithm.

10

37. The computer system, as set forth in claim 30, wherein the error detection logic is configured to correct single bit errors on the command bus.

15

38. The computer system, as set forth in claim 30, wherein the error detection logic is configured to detect multi-bit errors on the command bus and further configured to transmit an unrecoverable command error message to the host/data controller when an unrecoverable multi-bit error is detected on the command bus.

20

39. A method of exchanging information in a redundant memory system, comprising the acts of:

detecting errors on a command bus, the errors comprising one of a single bit error and a
5 multi-bit error;

correcting any single bit errors detected on the command bus; and

generating an error message if a multi-bit error is detected on the command bus.

10
40. The method of exchanging information, as set forth in claim 39, wherein the act of
correcting comprises the act of correcting any single bit errors detected on the command bus
using an ECC algorithm.

15th
41. The method of exchanging information, as set forth in claim 39, wherein the act of
detecting errors, comprises the act of detecting errors on a command bus, the command bus
operably coupled between a host/data controller and a plurality of memory cartridges configured
20 to form a redundant memory system.

42. The method of exchanging information, as set forth in claim 41, wherein the act of generating comprises the act of generating an error message from error detection logic located on the command bus to the host/data controller.

5

43. The method of exchanging information, as set forth in claim 42, comprising the act of powering down the memory cartridge in which the multi-bit error is detected in response to the error message generated from the error detection logic.

10
11
12
13
14
15
16
17
18
19
20

44. A memory cartridge comprising:

a plurality of memory modules, each of the plurality of memory modules comprising a reserved segment of non-volatile memory configured to store information unique to the corresponding memory module; and

a memory controller configured to detect errors in each of the plurality of memory modules and configured to facilitate storage of information correlative to the errors detected in the plurality of memory modules in the respective reserved segment of non-volatile memory.

20

45. The memory cartridge, as set forth in claim 44, wherein the plurality of memory modules comprises a plurality of dual inline memory modules (DIMMs).

5 46. The memory cartridge, as set forth in claim 44, wherein each of the plurality of reserved segments of non-volatile memory is configured to store identification information corresponding to the respective memory module.

10 47. The memory cartridge, as set forth in claim 44, wherein each of the plurality of reserved segments of non-volatile memory comprises 128 bytes of memory.

15* 48. The memory cartridge, as set forth in claim 44, wherein the memory controller comprises ECC logic to detect errors in each of the plurality of memory modules.

20 49. The memory cartridge, as set forth in claim 44, wherein the memory controller is configured to receive error information from a host/data controller, the error information correlative to errors detected in the plurality of memory modules, and wherein the memory controller is further configured to facilitate storage of the error information from the host/data controller in the respective reserved segment of non-volatile memory.

50. A method of storing information on a memory module, comprising the acts of:

accessing an IIC interface on the memory module, the IIC interface comprising a non-volatile memory segment; and

5

storing identification information correlative to the memory module in the IIC interface.

10 51. The method of storing information on a memory module, as set forth in claim 50, wherein
the act of accessing comprises the act of accessing an IIC interface on a dual inline memory
module.

15 52. The method of storing information on a memory module, as set forth in claim 50, wherein
the act of storing comprises the act of storing a unique module identification number correlative
to the memory module.

20 53. A method of storing error detection information on a memory module comprising the acts
of:

detecting an error on the memory module; and

storing information correlative to the error in a reserved segment of the memory module, the reserved segment comprising non-volatile memory.

5 54. The method of storing error detection information, as set forth in claim 53, wherein the act of detecting comprises the act of detecting an error on the memory module using an ECC algorithm.

10 55. The method of storing error detection information, as set forth in claim 53, wherein the act of storing comprises the act of storing an error type correlative to the type of error.

15 56. The method of storing error detection information, as set forth in claim 53, wherein the act of storing comprises the act of storing an address correlative to the address in which the error is detected.

57. A computer system comprising:

20 a memory cartridge comprising a plurality of memory modules, the memory cartridge configured to be hot-pluggable and wherein each of the memory modules

comprises a plurality of addresses corresponding to storage locations in the memory modules;

5 a host/data controller coupled to the memory cartridge and configured to facilitate a hot plug operation;

10 an address register configured to incrementally track the hot plug operation through the corresponding plurality of addresses; and

15 an indication device configured to provide a user with optical indication of progress of the hot plug operation.

58. The computer system, as set forth in claim 57, wherein the plurality of memory modules comprises a plurality of dual inline memory modules (DIMMs).

20 15 59. The computer system, as set forth in claim 57, wherein the host/data controller comprises software configured to monitor the address register and to provide an output signal corresponding to the a percentage of address registers which have completed the hot plug operations.

60. The computer system, as set forth in claim 59, wherein the indication device is configured to receive the output signal from the host/data controller.

5 61. The computer system, as set forth in claim 60, wherein the indication device is configured to provide an optical indication correlative to the output signal.

10 62. The computer system, as set forth in claim 57, wherein the hot plug operation comprises an initialization procedure to initialize the memory cartridge.

15 63. The computer system, as set forth in claim 57, wherein the hot plug operation comprises a rebuilding procedure to write data to the memory cartridge.

64. The computer system, as set forth in claim 57, wherein the hot plug operation comprises a verifying procedure to validate data written to the memory cartridge.

20 65. The computer system, as set forth in claim 57, wherein the address register comprises an entry for each address in the memory cartridge.

66. The computer system, as set forth in claim 57, wherein the indicator device comprises a plurality of light emitting diodes (LEDs).

5 67. The computer system, as set forth in claim 66, wherein the indication device comprises four light emitting diodes (LEDs).

10 68. A method of providing a user with progress status during a memory cartridge replacement procedure in a redundant memory system comprising the acts of:

15 inserting a memory cartridge into a system;

initiating a hot-plug procedure;

20 tracking the incremental progress of the hot-plug procedure; and

providing an optical indication correlative to the incremental progress.

20 69. The method of providing a user with progress status during a memory cartridge replacement procedure, as set forth in claim 68, wherein the act of inserting comprises the act of manually inserting the memory cartridge into the system.

70. The method of providing a user with progress status during a memory cartridge replacement procedure, as set forth in claim 68, wherein the act of initiating comprises the act of initiating an initialization procedure to initialize the memory cartridge.

5

71. The method of providing a user with progress status during a memory cartridge replacement procedure, as set forth in claim 68, wherein the act of initiating comprises the act of initiating a rebuilding procedure to write reconstructed data to the memory cartridge.

72. The method of providing a user with progress status during a memory cartridge replacement procedure, as set forth in claim 71, wherein the act of initiating comprises the act of initiating a verification procedure to verify the validity of reconstructed data written to the memory cartridge.

15

73. The method of providing a user with progress status during a memory cartridge replacement procedure, as set forth in claim 68, wherein the act of tracking comprises the act of monitoring a configuration register.

20

74. The method of providing a user with progress status during a memory cartridge replacement procedure, as set forth in claim 68, wherein the act of providing comprises the act of providing a user with an optical indication correlative to the incremental progress.

5

75. The method of providing a user with progress status during a memory cartridge replacement procedure, as set forth in claim 74, wherein the act of providing comprises the act of illuminating one or more light emitting diodes (LEDs) correlative to the incremental progress.

10
15

76. A method of manufacturing a redundant memory system comprising the acts of:

providing one or more hot-pluggable redundant memory segments; and

15

providing an indicator device to indicate the incremental progress of a hot-plug procedure.

77. The method of manufacturing a redundant memory system, as set forth in claim 76, wherein the act of providing an indicator device comprises the act of providing an optical indicator device.

78. The method of manufacturing a redundant memory system, as set forth in claim 77, wherein the act of providing an optical indicator device comprises the act of providing one or more light emitting diodes (LEDs).

5

79. A system comprising:

a redundant memory system comprising a plurality of memory cartridges, wherein each memory cartridge comprises a corresponding cartridge indicator; and

10 a terminal operably coupled to the redundant memory system and located remotely with respect to the redundant memory system, wherein the terminal is configured to initiate a cartridge signal to activate the cartridge indicator.

15

80. The system, as set forth in claim 79, wherein each of the plurality of cartridge indicators comprises a light emitting diode (LED).

20

81. The system, as set forth in claim 80, wherein the terminal is configured to initiate a cartridge signal to illuminate the light emitting diode (LED).

82. The system, as set forth in claim 79, wherein the terminal is configured to initiate the cartridge signal to activate the cartridge indicator in response to a user-selected command entered at the terminal.

5

83. The system, as set forth in claim 79, wherein each of the plurality of memory cartridges comprises a plurality of memory modules and a module indicator corresponding to each of the memory modules; and wherein the terminal is configured to initiate a module signal to activate the corresponding module indicator.

10

84. The system, as set forth in claim 83, wherein each of the plurality of module indicators comprises a light emitting diode (LED).

15

85. The system, as set forth in claim 84, wherein the terminal is configured to initiate a module signal to illuminate the light emitting diode (LED).

20

86. The system, as set forth in claim 83, wherein the terminal is configured to initiate the module signal to activate the module indicator in response to a user-selected command entered at the terminal.

87. A method of identifying a memory portion in a redundant memory system comprising the acts of:

5 initiating a command from a terminal, the terminal being located remotely with respect to the system; and

10 activating an illumination device on the memory portion in response to the command from the terminal.

15 88. The method of identifying a memory portion in a redundant memory system, as set forth in claim 87, wherein the act of initiating comprises the act of initiating the command by a user.

20 89. The method of identifying a memory portion in a redundant memory system, as set forth in claim 87, wherein the act of activating comprises the act of activating a light emitting diode (LED) in response to the command from the terminal.

90. The method of identifying a memory portion in a redundant memory system, as set forth in claim 87, wherein the memory portion comprises a memory cartridge.

91. The method of identifying a memory portion in a redundant memory system, as set forth in claim 87, wherein the memory portion comprises a memory module.